Ultracapacitor Based Power Supply for CubeSats, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

Future satellite systems and interplanetary missions are projected to require power electronics and energy storage systems that are less massive and smaller than the current State of the Art. Modern CubeSats rely heavily on solar panels to provide the necessary energy for operation. Additionally, radioisotope thermoelectric generators (RTGs) are the primary source of energy responsible for supporting long duration missions where other sources of energy are not available or are logistically prohibitive to utilize. In both cases, to satisfy the electrical requirements of higher powered loads Li-ion battery solutions must increase in both weight and size. FastCAP Systems is proposing an ultracapacitor based hybrid power supply (HPS) to dramatically reduce the size and weight of conventional high power energy storage solutions while increasing power handling capability. The proposed system will incorporate FastCAPs patented technology for harsh environment and ruggedized ultracapacitors already proven in the oil and gas industry and currently being developed across multiple grants for space exploration. The targeted application that this proposal will focus on is a high power (> 100W) HPS for integration into CubeSats. Ultracapacitors have a relatively high power density that is roughly 10 to 100 times greater than Li-ion batteries and can be integrated into an energy storage system to both increase power handling capability and reduce the weight and size of a system designed for Li-ion batteries alone. The HPS will be responsible for charging and managing its ultracapacitor banks as well as performing system diagnostics that can be reported through the unit's communication port. The system will embrace modular design techniques similar to those already employed by FastCAP's energy exploration systems and consist of two modules.

Primary U.S. Work Locations and Key Partners

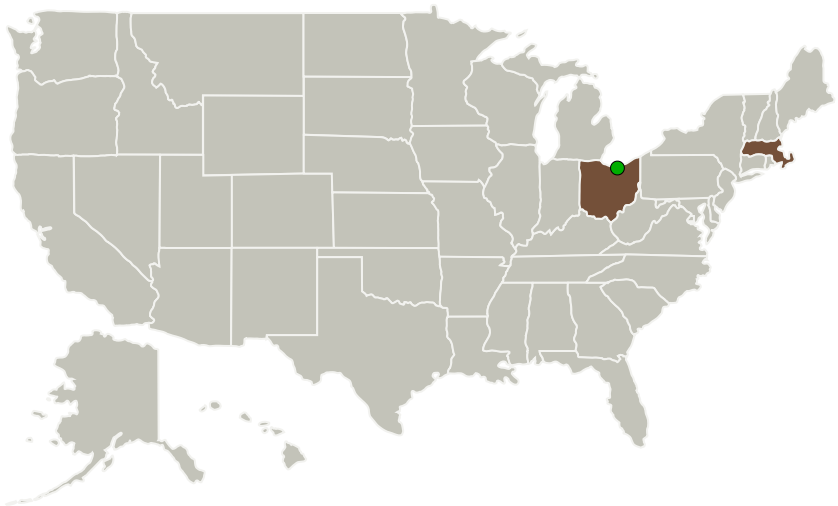

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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
FastCAP Systems Corporation	Lead Organization	Industry	Boston, Massachusetts
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140867)*

Images

Briefing Chart Image
Ultracapacitor Based Power Supply for CubeSats, Phase I
(https://techport.nasa.gov/image/128961)

Final Summary Chart Image
Ultracapacitor Based Power Supply for CubeSats, Phase I Project Image
(https://techport.nasa.gov/image/130788)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
FastCAP Systems Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

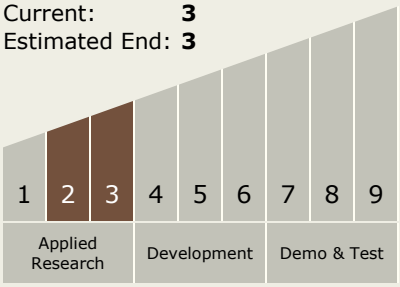
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Joseph Lane

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.3 Advanced Concepts for Energy Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System